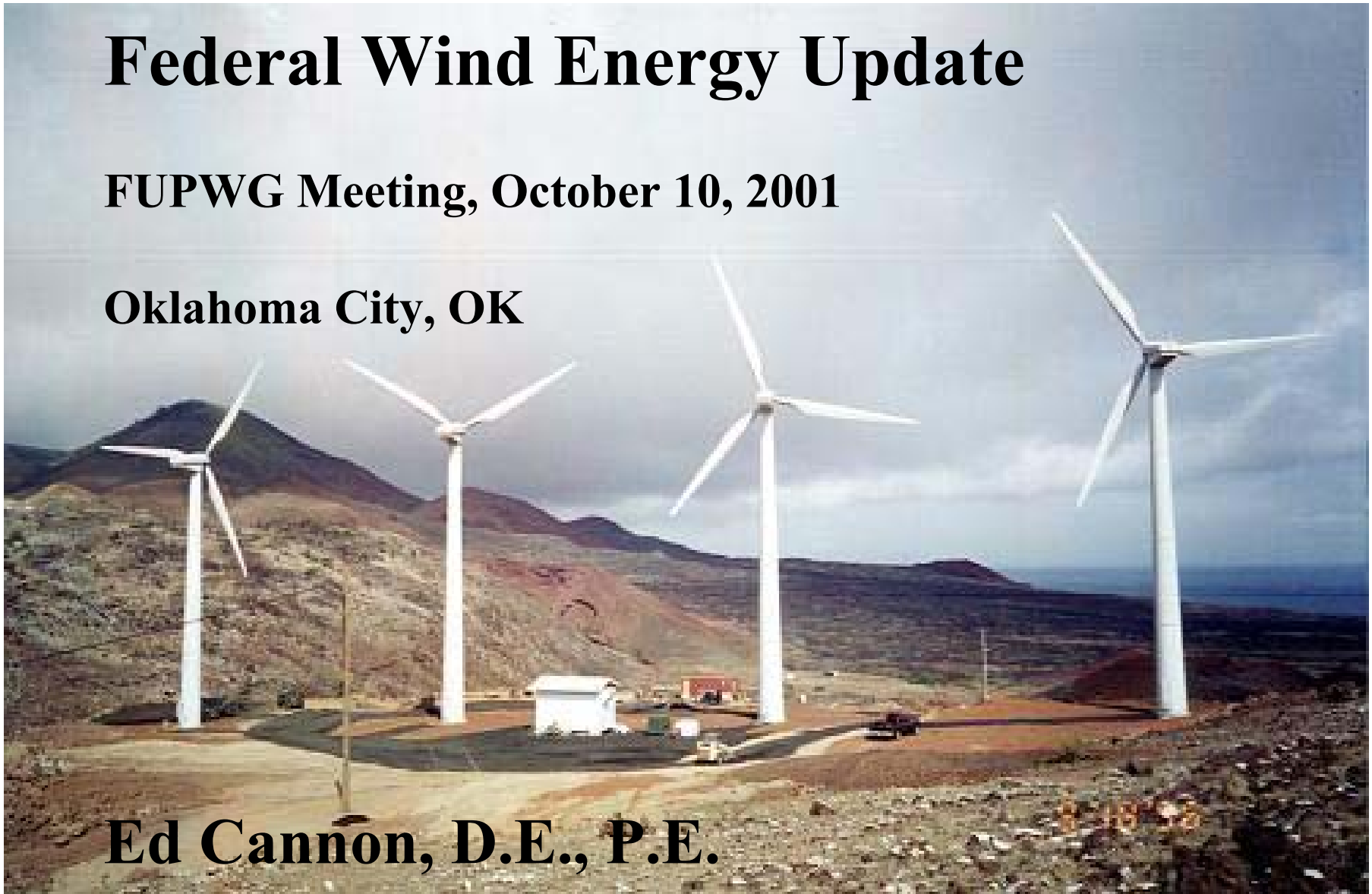
NREL
Wind Energy Program

Federal Wind Energy Update

FUPWG Meeting, October 10, 2001

Oklahoma City, OK



Ed Cannon, D.E., P.E.

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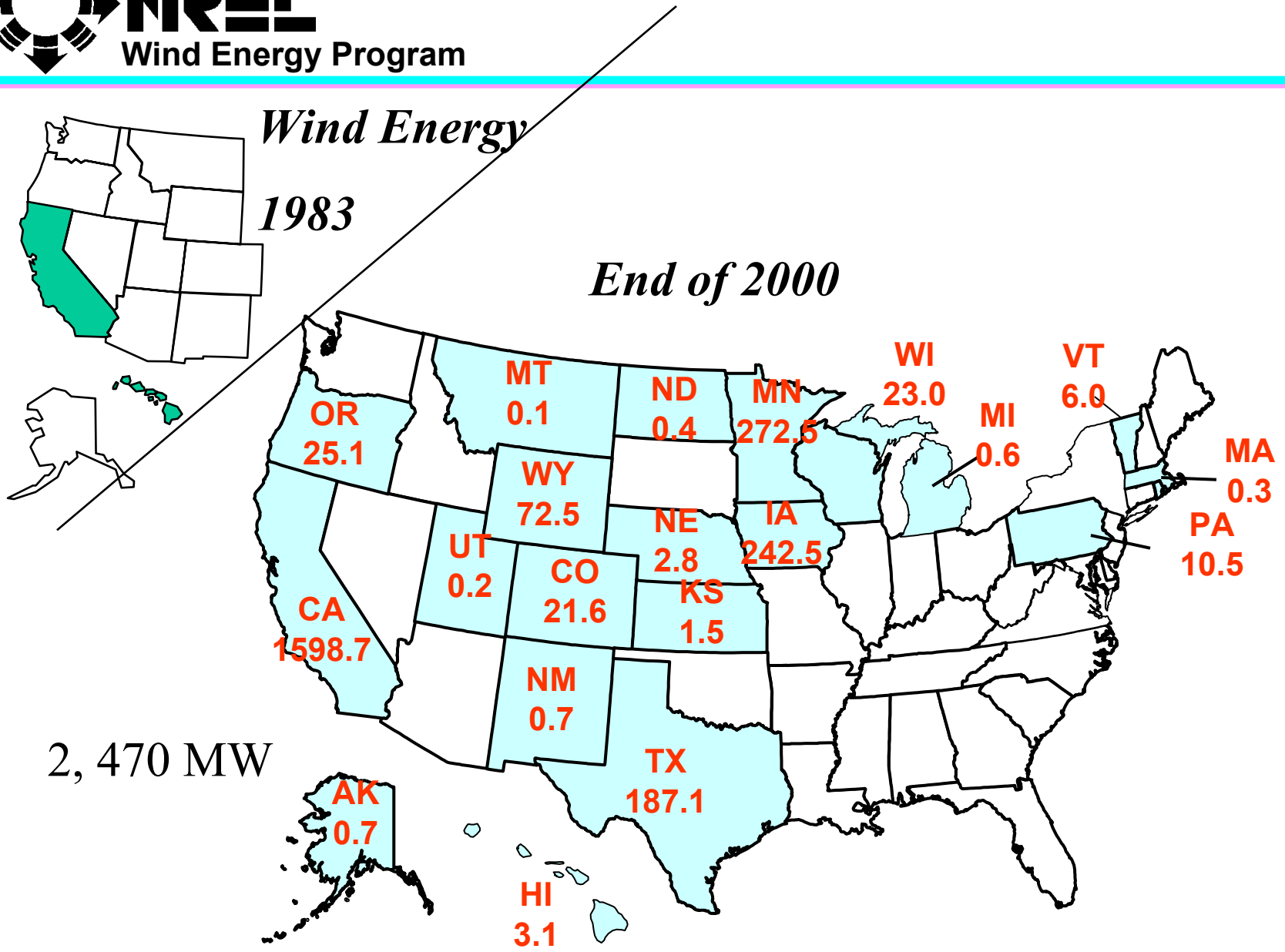

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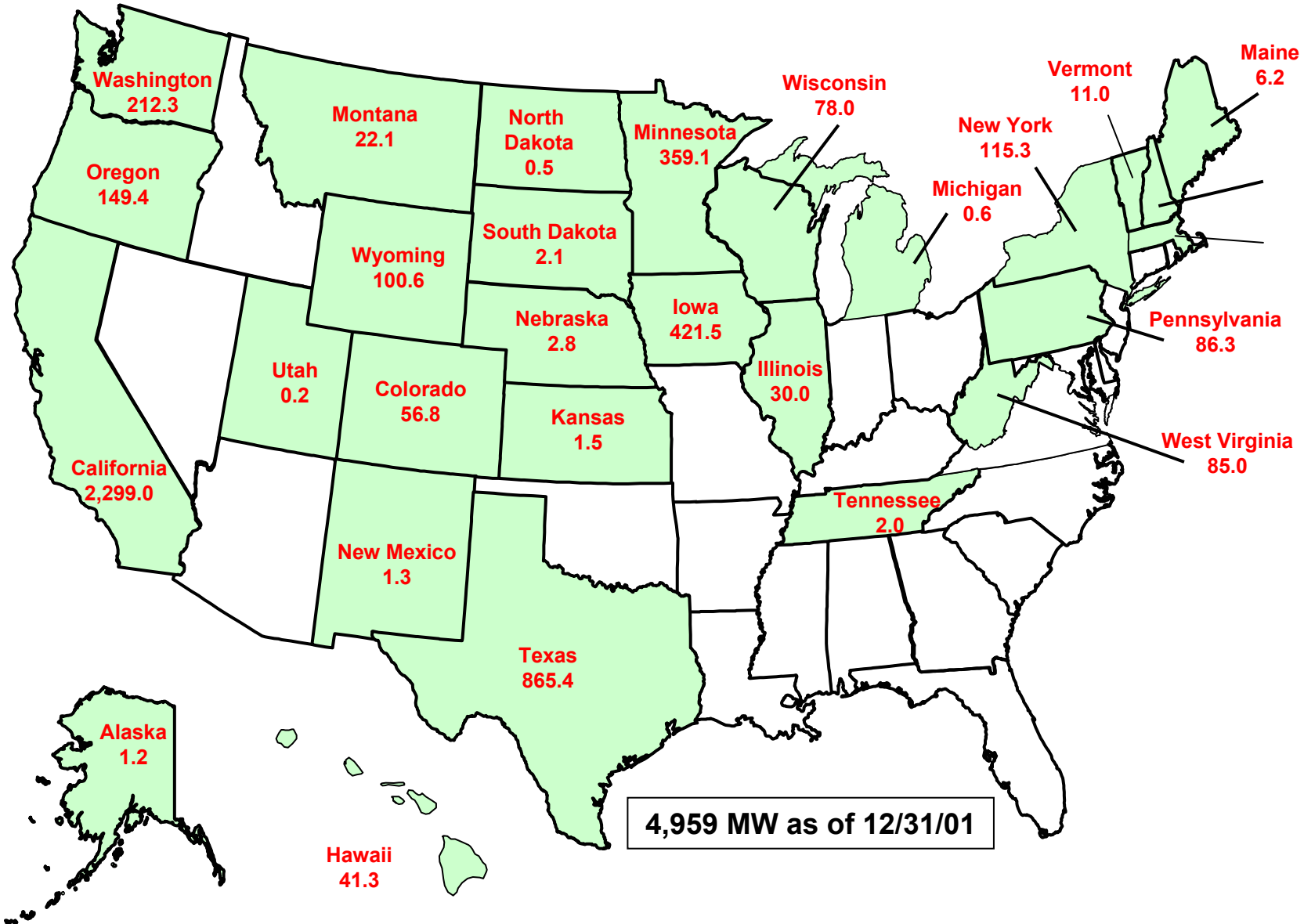
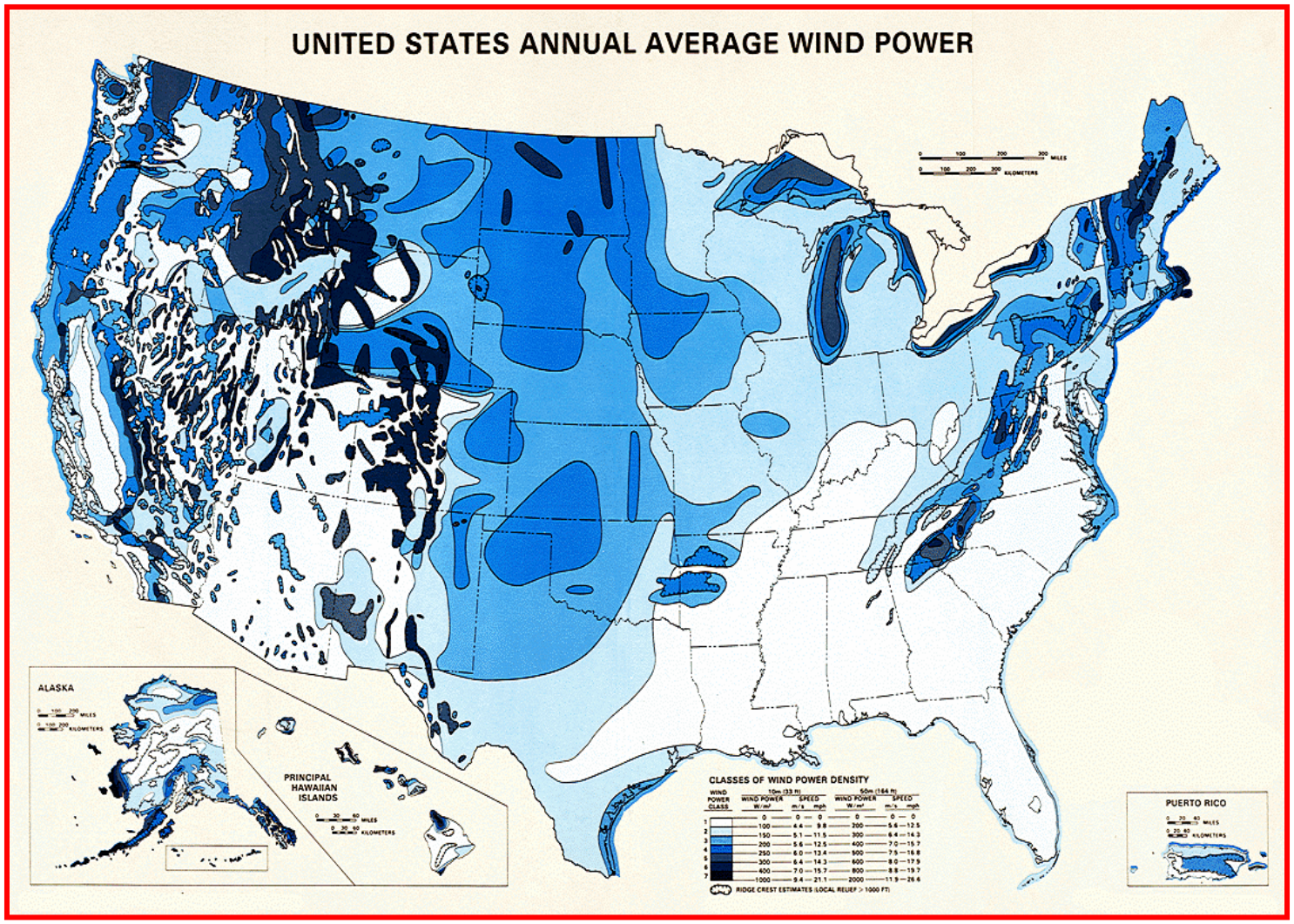
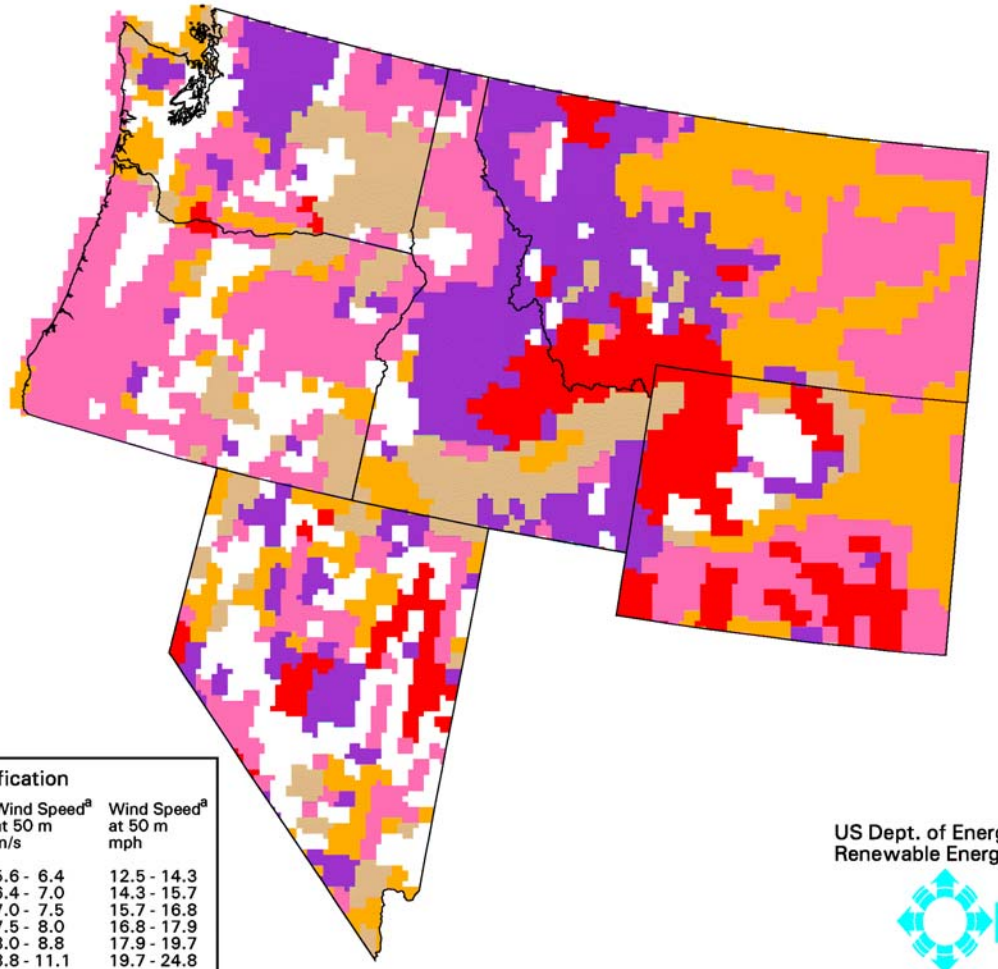
U.S. Wind Power - Expected by end of 2001 (MW)




UNITED STATES ANNUAL AVERAGE WIND POWER
ALASKA
PRINCIPAL HAWAIIAN ISLANDS
CLASSES OF WIND POWER DENSITY
PUERTO RICO

United States - Northwest Region



Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed[a] at 50 m m/s	Wind Speed[a] at 50 m mph
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

[a] Wind speeds are based on a Weibull k value of 2.0

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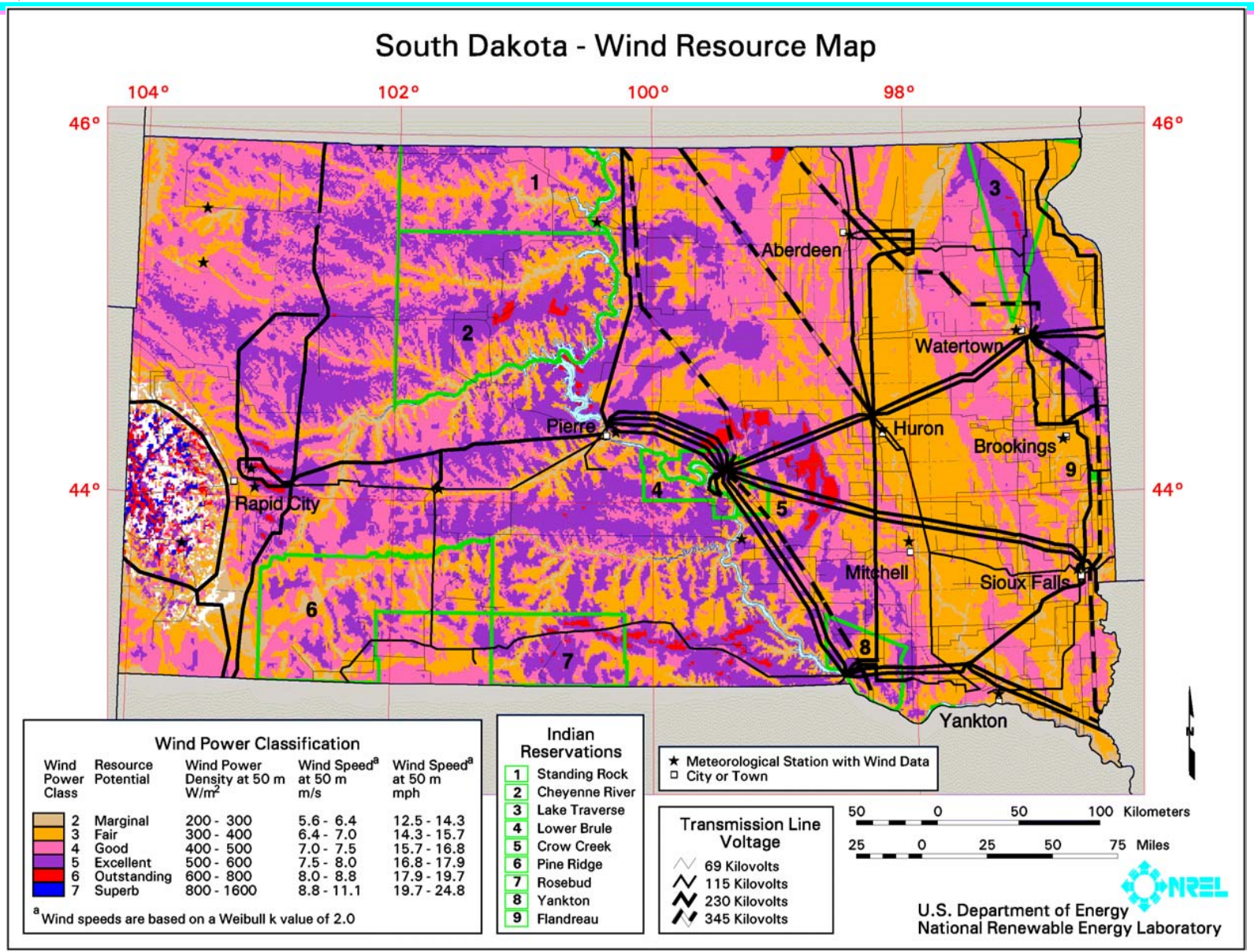
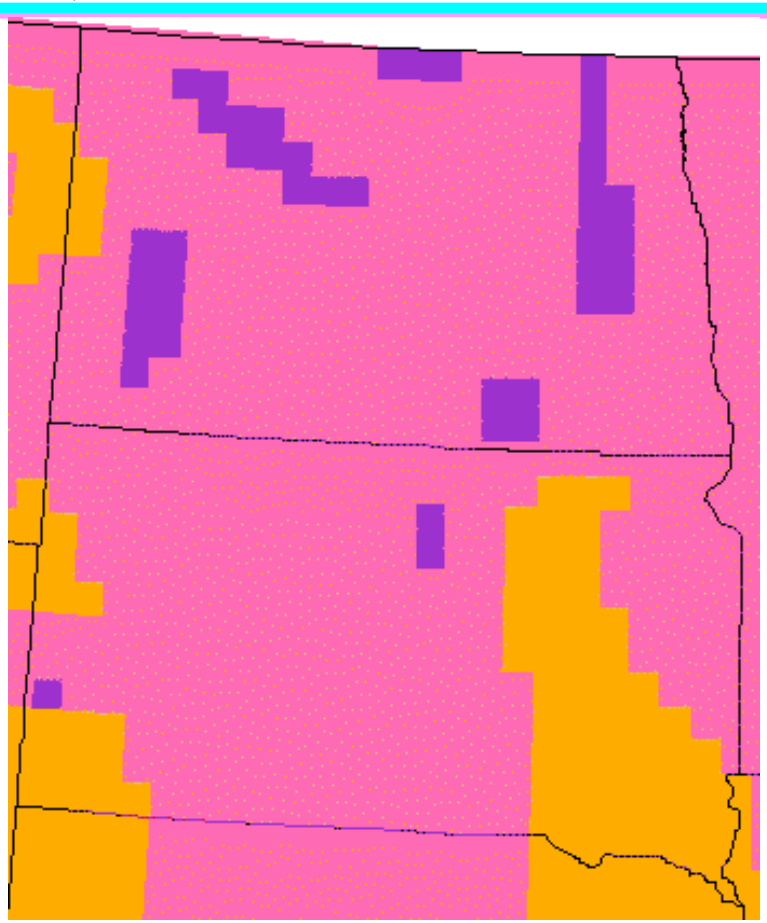
DM Heimiller 28-JUL-2000 2.1.2

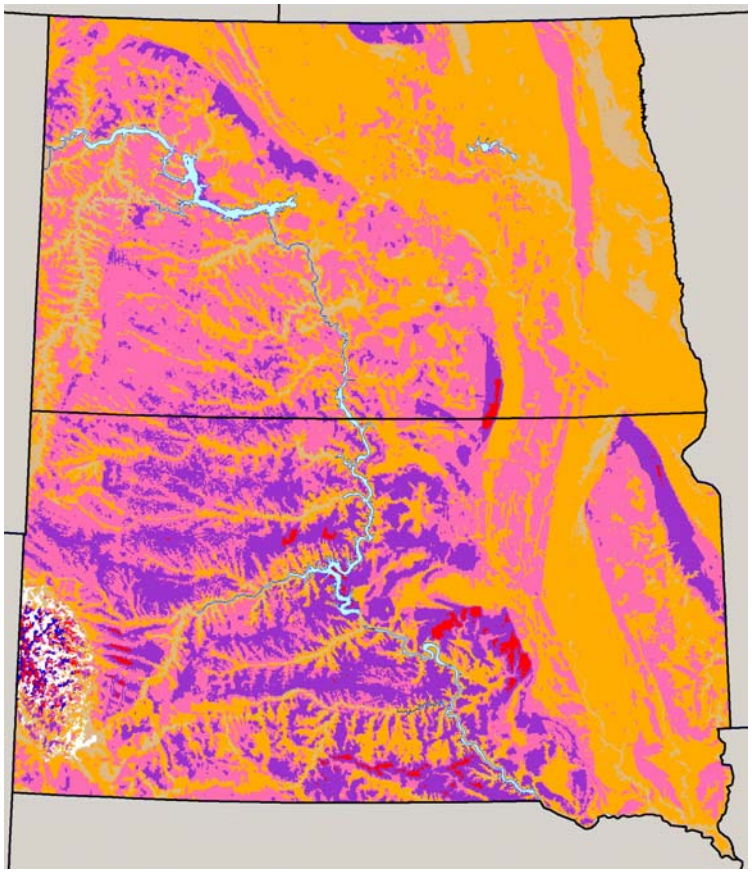

South Dakota - Wind Resource Map
104°
102°
100°
98°
46°
44°
Aberdeen
Watertown
Pierre
Huron
Brookings
Rapid City
Mitchell
Sioux Falls
Yankton
1
2
3
4
5
6
7
8
9
Wind Power Classification
Wind Power Class
Resource Potential
Wind Power Density at 50 m W/m²
Wind Speed[a] at 50 m m/s
Wind Speed[a] at 50 m mph
2 Marginal 200 - 300 5.6 - 6.4 12.5 - 14.3
3 Fair 300 - 400 6.4 - 7.0 14.3 - 15.7
4 Good 400 - 500 7.0 - 7.5 15.7 - 16.8
5 Excellent 500 - 600 7.5 - 8.0 16.8 - 17.9
6 Outstanding 600 - 800 8.0 - 8.8 17.9 - 19.7
7 Superb 800 - 1600 8.8 - 11.1 19.7 - 24.8
[a] Wind speeds are based on a Weibull k value of 2.0
Indian Reservations
1 Standing Rock
2 Cheyenne River
3 Lake Traverse
4 Lower Brule
5 Crow Creek
6 Pine Ridge
7 Rosebud
8 Yankton
9 Flandreau
★ Meteorological Station with Wind Data
□ City or Town
Transmission Line Voltage
69 Kilovolts
115 Kilovolts
230 Kilovolts
345 Kilovolts
50 0 50 100 Kilometers
25 0 25 50 75 Miles
U.S. Department of Energy
National Renewable Energy Laboratory

Comparison of Digital Wind Map from 1987 U.S. Wind Atlas and New (2000) High-Resolution (1-km^2) Wind Map North and South Dakota

NREL Wind Energy Program



1987



2000

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[a] Wind speeds are based on a Weibull k value of 2.0

- Federal wind projects continue to operate without major problems.
- Military services planning additional turbines.

- AF planning up to ten more turbines at Ascension Island
- AF considering wind turbines at Vandenberg AFB, CA
- AF purchasing 100% wind energy at Edwards AFB, CA

- Navy generating 14% of annual energy on San Clemente Island, CA from wind.

- Considering turbines for Puerto Rico and Wallops Island, VA

- Army has single turbine at National Guard base in Utah--limited success
- Looking for other possible applications in Hawaii, Texas, and New York
- Ft. Richardson, AK, to begin purchasing electricity. Possible green option.

- Denver federal wind purchase is finally done!
- Xcel Energy's WindSource
- 2.5¢/kWh premium

- Xcel doubling its WindSource
- Colorado PUC mandated 160 MW of wind as "least cost" source